REMARKS

In the Office Action the Examiner noted that claims 1-12 were pending in the application and the Examiner rejected all claims. By this Amendment, various claims have been amended. Thus, claims 1-12 are pending in the application. The Examiner's rejections are traversed below.

Entry of this Amendment

It is submitted that the amendments to the claims which have been made by this Amendment are made in direct response to the questions raised by the Examiner in the Office Action. For example, to avoid any confusion which may have occurred with respect to the recitation of "front input/output unit data" and "rear input/output unit data", the claims have been amended to recite "link data" instead of "input/output unit data". This language is consistent with the terminology used in describing Figure 3 (see paragraph 21 on page 5 of the Office Action). It is believed that these amendments simply restate what was already recited in the claims and therefore, it is not believed that any additional search should be required with respect to these claims. Therefore, it is submitted that these amendments under 37 C.F.R. § 1.116 should be entered and considered.

Prior Art Rejections of Claims

In items 5-10 on pages 2-12 of the Office Action the Examiner rejected claims 1-9 under 35 U.S.C. §102 or §103 as unpatentable over one or a combination of U.S. Patent 5,298,007 to Miyajima; U.S. Patent 5,578,913 to Yasuda; U.S. Patent 6,088,624 to Khan et al; U.S. Patent 5,640,559 to Silberbauer et al.; U.S. Patent 5,258,905 to Yamauchi; or U.S. Patent 5,237,665 to Seki. The Examiner presents two separate types of rejections which employ either Yasuda et al. or Miyajima as the primary reference.

The Prior Art

U.S. Patent 5,290,006 to Miyajima is directed to a machining method of a punch press machine by which a moving time of a workpiece table is excluded in a punch press machining to improve operation efficiency. Figure 2 is a block diagram of a numerical control machine and Figure 3 is a diagram explaining an example of a machining program which is stored in a CMOS

24 (Figure 2). The machining program illustrated in Figure 3 illustrates a macro command which begins with "U" and ends with "V" so that a machining command P2 is U90 and V90 of a machining command P6 is a macro end command.

U.S. Patent 5,578,913 to Yasuda et al. is directed to a numerical control device which can perform machining processes in a short time while maintaining high precision regardless of the order in which the programs are commanded. Consecutive blocks of a numerical control program are retrieved on a block-by-block basis, and a pre-execution end position and a post-execution end position value for each of the blocks of the numerical control device are set and stored in a ROM (see Abstract). A non-volatile memory 53 (Figure 2) stores parameters such as end-position values as illustrated in the Appendix at Table I (see column 13) post-execution end-position values and pre-execution end-position values for each axis are stored in the non-volatile memory 53 according to the combination of commands to be executed. ROM 51 stores programs for overall control of the numerical control device 50 and a ROM 52 stores data such as in-position values for before and after execution of each axis (column 4, lines 30-53).

U.S. Patent 6,088,624 to Kahn is directed to an industrial controller with flexible data structures. The Examiner cited the Kahn reference for its disclosure relating to length.

U.S. Patent 5,640,559 to Silberbauer et al. is directed to a method for encoding and decoding units of data representing the method for encoding and decoding stored units of data representing entity/relationship data, function calls and file data. The Examiner cited Silberbauer on the basis that it discloses encoding a length of the unit of data into a length field of a prefix for the data unit.

U.S. Patent 5,258,905 to Yamauchi was cited by the Examiner with reference to the concept of a branch instruction as set forth in claims 3, 4 and 10.

U.S. Patent 5,237,665 to Seki was cited by the Examiner for its disclosure of editing or modifying a program block with reference to claims 5, 7, 8, 11 and 12.

The Present Claimed Invention

The present invention as set forth in claim 1 is directed to a numerical controller for controlling a machine according to a machining program. A storage device or medium stores input/output units each storing program block data obtained by dividing the machining program so that divided portions of the machining program are stored in respective ones of the input/output units. Each input/output unit stores additional information associated with the program block data stored in the input/output unit. The additional information includes an

effective data length of the program block, front link data designating an input/output unit immediately preceding each input/output unit in a sequence of the machining program, and rear link data designating an input/output unit following each input/output unit in a sequence of the machining program. A processor processes the input/output units to run the machining program. An interface inputs/outputs the input/output units between the storage device or medium and the processor. It is submitted that none of the prior art teaches or suggests the features of the present invention wherein each input/output unit stores additional information associated with the program block data including "front link data designating an input/output unit immediately preceding each input/output unit in a sequence of the machining program, and rear link data designating an input/output unit following each input/output unit in a sequence of the machining program."

The Examiner's Criticism of the Claims

On page 15 of the Office Action the Examiner issued a number of criticisms of what he felt the claims recited. These points are addressed below.

First the Examiner took the position that the term input/output unit does not place any limitation on what the unit of data is required to be. The claims have been amended to further emphasize that the input/output units each store program block data which corresponds to a divided portion of the machining program, as well as additional information associated with the program block data.

Secondly, the Examiner takes the position that the claims do not require storing anything in any input/output units. As explained above, the claims clearly specify what is stored in the input/output units.

Claim 1 Patentably Distinguishes Over The Prior Art

In response to the prior patentability arguments set forth by the applicants, the Examiner takes the position that the code U01 in Figure 3 of Miyajima is front input/output unit data and that the code V01 is rear input/output data (see pages 14 and 15 of the Office Action).

It is submitted that the identifiers U90 and V90 illustrated in Figure 3 of Miyajima et al. do not correspond to the claim features since U and V correspond to a beginning command and an end command and do not refer to prior or succeeding input/output units. The elements U01, V01; U02, V02; U03, V03 the machining commands P3-P5 in Figure 3 of the Miyajima reference,

represent macro commands for starting and ending machining programs 101, 102 and 103 associated therewith as custom macros. These elements do not represent any information or link data for use in designating an input/out unit immediately preceding each input/output unit or designating an input/output unit following each input/output unit in a sequence of the machining program.

It is also submitted that it is clear that the commands of Miyajima do not correspond to the claimed input/output units. Claim 1 specifies that the input/output units each store program block data obtained by dividing the machining program so that divided portions of the machining program are stored in respective ones of the input/output units. Each input/output unit also stores additional information associated with the program block data stored in the input/output unit. Therefore, it is submitted that the Miyajima commands could not correspond to the claimed input/output units.

It is also submitted that the pre-execution position values which were stored in the memory 53 of Yasuda et al. do not correspond to input/output units as alleged by the Examiner on page 14 of the Office Action. In addition, such values are not stored in input/output units which store the program block data as claimed. Instead, this data is stored in ROM 51. Further, there is no indication that this information corresponds to a feature which would indicate a prior input/output unit or a succeeding input/output unit. Further, these features were not taught by the other prior art relied on by the Examiner. In the Yasuda reference the memory means in claim 1 at column 13, lines 28-37 relied on by the Examiner, is recited to store a pre-execution in-position value and a post-execution in-position value which is defined in this paragraph, and does not disclose or suggest front link data designating an input/output unit immediately preceding each input/output unit link in a sequence of the machining program and rear data designating an input/output unit following each input/output unit in the sequence of the machining program as recited in claim 1.

In summary, it is submitted that the prior art does not teach or suggest:

> a storage device or medium storing input/output units each including program block data obtained by dividing the machining program so that divided portions of the machining program are stored in respective ones of the input/output units, each input/output unit storing additional information associated with the program block data stored in the input/output unit, said additional information including an effective data length of the program block, front link data designating an input/output unit immediately

preceding each input/output unit in a sequence of the machining program, and rear link data designating an input/output unit following each input/output unit in the sequence of the machining program;

Therefore claim 1 patentably distinguishes over the prior art.

Further, as explained in detail in the specification, the use of the specific additional information in the input/output units simplifies the editing/addition, deletion or use of a branching instruction in the machining program. Therefore, it is submitted that claim 1 patentably distinguishes over the prior art.

Claims 2-8

Claims 2-8 depend, directly or indirectly from claim 1, and include all of the features of that claim plus additional features which are not taught or suggested by the prior art. Therefore, it is submitted that claims 2-8 patentably distinguish over the prior art.

Claims 9-12

Independent claim 9 as amended is directed to a numerical controller which comprises:

a storage device storing a plurality of input/output units, each of the input/output units storing program data obtained by dividing the machining program so that divided portions of the machining program are stored in respective ones of the input/output units, each of the input/output units storing additional information associated with the program data stored in the input/output units, the additional information including first link data designating an input/output immediately preceding each input/output unit in a sequence of the machining program, and second link data designating an input/output unit following each input/output unit in the sequence of the machining program; and

Therefore, it is submitted that claim 9 patentably distinguishes over the prior art.

Claims 10-12 depend, directly or indirectly from claim 9 and include all of the features of that claim plus additional features which are not taught or suggested by the prior art. Therefore, it is submitted that claims 10-12 patentably distinguish over the prior art.

Summary

It is submitted that none of the references, either taken alone or in combination teach the present claimed invention. Thus, claims 1-12 are deemed to be in a condition suitable for allowance. Reconsideration of the claims and an early notice of allowance are earnestly solicited.

Respectfully submitted,

STAAS & HALSEY LLP

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By: _____
John C. Garvey
Registration No. 28,607

1201 New York Ave, N.W., Suite 700
Washington, D.C. 20005
Telephone: (202) 434-1500
Facsimile: (202) 434-1501